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A BRIEF HISTORICAL RÉSUMÉ OF HERPETOLOGICAL STUDIES IN THE GREAT BASIN OF THE WESTERN UNITED STATES

PART I. THE REPTILES¹

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INTRODUCTION

Among the numerous accounts of the early travelers into the western United States are those reports which introduce to us the Great Basin and its natural history. In this presentation we will only briefly review the faunistic and systematic studies which are of historical importance to the herpetology of the Great Basin. Although many workers have referred in one way or another to this vast inland basin region, we will include only those accounts which have, in our opinion, made a contribution to a better understanding of our knowledge of the biology of its herpetofauna. We have, therefore, been arbitrary in selecting only those studies which have dealt with Great Basin material. This has eliminated many excellent studies dealing with areas adjoining the basin itself.

The Great Basin, consisting of a number of distinct and disjunct inland basins with its lakes and desert basins surrounded by usually north-south oriented mountains, is a most remarkable geographical region. Most Americans have heard of, and perhaps remember, some of the tales of pioneers who traversed the area a hundred years ago. However, few are aware of the contributions made by those naturalists who for over a hundred years have been slowly extracting bit by bit a more comprehensive knowledge of the natural history from this still relatively inhospitable region.

Both authors have not only lived for many years in the Great Basin, but have also done considerable herpetological field work in various portions of it. The senior author has lived a number of years in the western part (Lahontan Basin) and is familiar with the east-

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ern California and western Nevada basins, whereas the junior author is acquainted with the eastern part (Bonneville Basin) and is familiar with the eastern Nevada and the western Utah basins. One or both of us have extended our field work into other basins, among which are Truckee Meadows, Lake Tahoe, Amargosa Desert, Sarcobatus Flat, Charleston Mountains, Inyo Mountains, Saline Valley, Railroad Valley, Death Valley and the valleys of the Nevada Test Site. Thus we are familiar with many of the valleys and mountains and particularly with the major ones included in figure 1.

The Great Basin is not only a fascinating area geographically, but is comparably challenging from the standpoint of its fauna. Although much of the region is desert or semi-desert, it contains many herpetological species, most of which are to this day poorly known. Although most of the segments of the herpetofauna inhabit the desert valleys and the low, usually barren mountain ranges, a few species have survived in the more mesic situations of the mountains on the east and west perimeters and the forested mountains of the interior. These montane forms probably enjoyed a much wider distribution during the moist pluvial periods of the Pleistocene.

The physical delimitation of the Great Basin in this account is based on the 1953 edition of the map "Water Resources Development of the United States" by the United States Geological Survey. The Great Basin thus comprises all the land area not presently being drained into the Pacific Ocean, and which occurs between the crest of the Wasatch uplift in central Utah and southwestern Wyoming and the summits of the Sierra Nevada in eastern California (see figure 1).

HISTORICAL

The observation, collection, and the first organized study of the reptiles inhabiting the Great Basin began during the westward expansion and settlement over a century ago. Some of the historical aspects of zoological reconnaissance in the Great Basin are discussed in the works of Cope (1893), Merriam (1895), Van Denburgh and Slevin (1915), V. M. Tanner (1929 and 1940), Linsdale (1936, 1938, and 1940), Hall (1946), Durrant (1952) and Tanner and Jorgensen (1963).

The region was visited by white men as early as 1776 when Escalante and his party of Franciscan missionaries from New Mexico crossed the southern and eastern portions en route to California (Tanner, 1929, 1940; Woodbury, 1931). The northern and central portions of the territory were crossed by Jedediah Smith in 1826 and by Bonneville and Walker in 1833-1834. Captain John Charles Fremont was the first to apply the name "Great Basin" to this vast interior drainage region of Western North America. Although some of these earlier exploratory expeditions did record observations of reptiles in their journals, and published reports, few specimens, if any, were collected and adequately preserved prior to 1850, or at least such specimens are to our knowledge not currently available for examination.

Many of the members of the early surveys were too busy mapping new routes, sketching and drawing new topographic features for the first time, and struggling with means of transportation to be vitally concerned with faunistic samples. Combine these factors with their fear for hostile Indians and renegades, and the accomplishments of these early surveyors were indeed impressive.

Following the conquest of the large western area of the North American continent from Mexico in 1848, which made the area including most of the Great Basin an integral part of the United States of America, there were, according to Nolan (1943) "numerous explorations by United States Army Engineers to determine the available railroad routes to the Pacific Coast. The most thorough

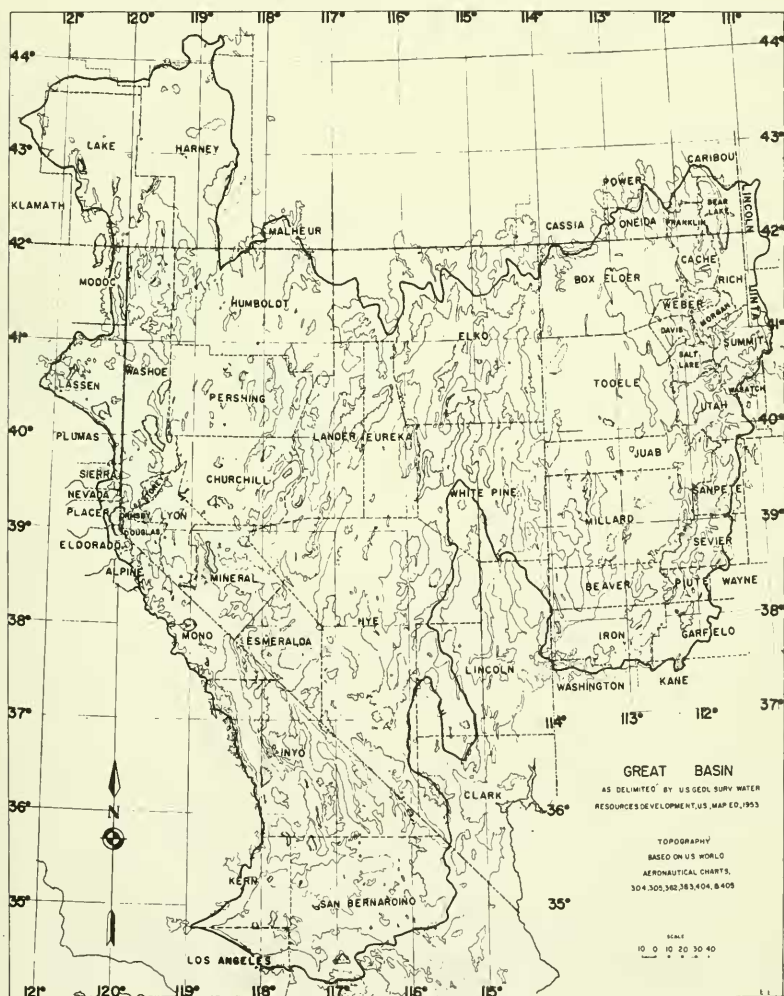


Fig. 1. Great Basin.

of the explorations were made across the north part of the Basin by Stansbury (1849), Beckwith (1854), Steptoe (1855), and Simpson (1858-9), and made across the southern portion by Whipple (1853) and Williamson (1854)." These surveys, known collectively as the Pacific Railroad Surveys, were sponsored by the Office of Explorations and Surveys, United States War Department, and most of the various tasks were performed by military personnel.

Spencer Fullerton Baird, at that time Assistant Secretary of the Smithsonian Institution of Washington, D. C., was responsible for the preparation of a series of preliminary and more detailed illustrated accounts of the reptiles collected on these surveys. Baird and Charles Girard (1852) published several accounts, with original descriptions of new species collected in the Great Basin, which were deposited in the National Museum.

James Graham Cooper (1870) reviewed for the first time some of the aspects of the geographical distribution of the fauna of California, and although he dealt mainly with the mammals and birds, reptiles were occasionally mentioned. Cooper noted, perhaps for the first time, the distinct character of the desert fauna of the Western Great Basin.

After the Civil War the United States government continued to sponsor expeditions to western North America to obtain more definitive information on the region. Surveys of the geology of the United States along the 40th parallel were organized under the leadership of Clarence King. Actual field operations were begun in 1867, and continued to 1873. Although primarily concerned with geological reconnaissance, a young zoologist, Robert Ridgway, was assigned to the expedition to collect mammals, birds and reptiles in the western Great Basin from July 4, 1867, until late September 1868. Ridgway's route of travel, according to a report by Harry Harris (1928), extended from California across Nevada to Utah and included among others such well known collecting sights as Truckee Meadows, Reno, Pyramid Lake, Ruby Mountains, Parley's Park (Wasatch Mts.) and Pack's Canyon (Uintah Mts.). In May, 1869, he returned to the Wasatch and Uintah Mountains to complete the survey in these areas. Specimens collected by Ridgway were deposited in the United States National Museum and are included in the report by Yarrow (1882).

In the tradition of the War Department, who sponsored the Railroad Surveys prior to the Civil War, the geographical surveys west of the 100th Meridian were organized by the War Department under the command of Lieutenant George Montague Wheeler in 1869. Teams of this survey (commonly referred to as the "Wheeler Survey") were active in part of the Great Basin from 1869 to 1878. Henry Wetherbee Henshaw worked as a zoologist on the Wheeler survey beginning in July, 1872, at Salt Lake City where he met Lt. Wheeler and became associated with the survey for the next eight years. On July 22, Henshaw and H. C. Yarrow left for Provo and the environs of Utah Lake. Thus was launched one of the more successful natural history surveys of the west. The western Great Basin was not visited for several years; however, their itinerary brought the

survey in the area of Carson City, Nevada, from August until September 15, 1876. From September 15 until November 7, Henshaw collected in the vicinity of Lake Tahoe (California-Nevada). Linsdale (1936:9) asserted that "In 1877 his field work began at Carson City, Nevada, where he worked from May 12 to June 6, and then started northward to end the season on October 1, in southern Oregon." During July 1878, Henshaw again started from Carson City and worked northward, collecting specimens of birds, reptiles, and amphibians, which were deposited in the United States National Museum. Dr. Harry Crècy Yarrow accompanied Henshaw during one field season in eastern Nevada. The herpetological results of all their field work were published by Yarrow and Henshaw (1878).

According to Henry Fairfield Osborn (1931), Edward Drinker Cope traversed the Great Basin, traveling from Salt Lake City, Utah, to Reno, Nevada, during 1879. In 1882 Cope returned to the Great Basin, traveling to Reno, then to Silver Lake, Oregon, back again to Reno, then to southern Idaho, and back again to Salt Lake City. Various aspects of the zoogeographic data obtained were subsequently published by Cope (1883a, b, c; 1889, 1896a, b; 1900).

Before actually visiting the Great Basin Cope published (1875) in the first Bulletin of the United States National Museum his Checklist of North American Batrachia and Reptilia including a listing of the higher groups and an essay on geographical distribution. Yarrow (1883) published a check list of North American reptiles and amphibians deposited in the United States National Museum, providing a list and a classification of all specimens of amphibians and reptiles collected by military and government personnel during the various surveys before 1882. This report included not only Great Basin records but records from other portions of the United States as well.

Little was added to the zoological literature from the western United States until the appearance of Clinton Hart Merriam's treatise on the biota of the San Francisco Mountains of Arizona (1890). Shortly after this, the Death Valley Expedition was organized under the direction of Merriam. This was the last of the major government-sponsored exploratory expeditions in the western United States in the 19th century. Informative accounts of this survey, which entered many parts of the southwestern Great Basin, are furnished by Cope (1893), Merriam (1895), and by Stejneger (1893).

Since the Death Valley Expedition, the United States National Museum has received specimens of reptiles collected in various parts of the Great Basin from several field representatives of government agencies, such as the Bureau of Biological Survey, and its successor, the Fish and Wildlife Service. Agencies created during the years of the depression (e.g., the Civilian Conservation Corps and Works Progress Administration), were responsible for the addition of specimens to the National Museum as well as to other institutions maintaining scientific collections. Several interested persons have sporadically contributed small samplings of the Great Basin herpetofauna to

the National Museum collections (e.g., Charles E. Burt, Paul Bartsch, Julius Hurter, J. O. Snyder and Adrian Vanderhorst).

John Van Denburgh (1897) presented the first account of the reptiles of the Pacific Coast and Great Basin, as his doctoral dissertation at Stanford University. Robert Baird McLain (1899), in a privately published pamphlet, was sharply critical of Van Denburgh's work. Several groups were critically reviewed (e.g., *Sceloporus occidentalis*), but generally speaking, McLain merely provided specimen documentation for the information included by Van Denburgh. Both Van Denburgh's and McLain's papers were based upon preserved specimens in the collection at Stanford University.

From May 23 to July 17, 1911, Professor John Otterbein Snyder, Stanford University, and Charles Howard Richardson, Jr., who in 1909 had assisted Walter Penn Taylor in Humboldt County, Nevada, collected a large sample of reptiles in the Lahontan Basin of west central Nevada and east central California. This work was done in conjunction with the ichthyological investigations of Snyder (1917) partly under the auspices of the United States Bureau of Fisheries. The herpetological results of this work were published by Richardson (1915). In this study, it was first pointed out that certain meristic and morphometric variations existed between the lizard populations of the Lahontan Basin and those of the more extensive and warmer deserts to the south. Richardson was also the first author to discern the difference between the sagebrush steppe and the cold desert areas. He noted that, "The flora of the desert immediately south of Pyramid and Walker Lakes is of a different character [than the sagebrush, *Artemisia tridentata*, predominating over the greater part of Nevada] *Sarcobatus* and other shrubs replacing, 'sagebrush.' This difference in the flora is correlated with a greater diversity in the reptilian fauna, and we find such southern forms as *Callisaurus* and *Sceloporus magister*." Most of the specimens obtained by Richardson and Snyder are now deposited in the Division of Systematic Biology (formerly the Natural History Museum), Stanford University, and in the United States National Museum. Around the area of Currant, in northeastern Nye County, Nevada, Georgia M. Bentley collected reptiles for the Natural History Museum, Stanford University, during the spring of 1916. Some of Bentley's observations were published (1918, 1919). The growth of the herpetological collection at Stanford University has continued, owing largely to the encouragement of field activities by Professor George Sprague Myers and the late Margaret Hamilton Storey. A brief historical review of the Stanford collections has been published by Leviton (1953). Banta (1957) has reported on some aspects of material obtained by him in the Great Basin and deposited in the Stanford collections.

Witmer Stone (1911) published a list of the amphibians and reptiles collected in the western Great Basin, and portions of several western states as well, which were deposited in the collections of the Academy of Natural Sciences of Philadelphia. This study was based

on material obtained by Mr. Morgan Hebard and Mr. James A. G. Rehn during the summers of 1909 and 1910.

During the summer of 1912, the University of Michigan Museum of Zoology sponsored a zoological expedition composed of Frederic M. Gage, Helen Thompson and Alexander Grant Ruthven, to northeastern Nevada. In addition to the herpetofauna, samples of molluscs, crustaceans and ants were obtained and studied. The exact area sampled was near the environs of the railroad town of Carlin in the western part of Elko County, and the northern part of Eureka County. Most of the specimens collected by the Michigan expedition were deposited in the Museum of Zoology at the University of Michigan. Ruthven and Helen Thompson Gage (1915) published the herpetological results of these field studies. This expedition, and the numerous published results which were to follow, inaugurated several studies on the herpetofauna of the Great Basin by members of the University of Michigan group. Ruthven (1926, 1932) and Lawrence Cooper Stuart (1932) continued to work in the eastern Great Basin for the Museum of Zoology. In 1936, Frank N. Blanchard visited the collections at Brigham Young University, University of Utah, California Academy of Sciences and other western collections. He completed the data needed for the study of the genus *Tantilla* (1939: post humously) which included several new descriptions.

During the 1930's Carl Leavitt Hubbs and his family obtained a large series of amphibians (mostly) and reptiles from widely scattered localities in the Great Basin. In the early forties Hubbs was assisted by Robert Rush Miller, and together they gathered extensive samples of zoological material from the Great Basin. Most of the material obtained during their field trips was found near streams and springs and was obtained in conjunction with their intensive ichthyological sampling, and was deposited in the collections of the Museum of Zoology at Michigan University. Out of these activities Hubbs and Miller (1948) were to develop the first comprehensive synthesis of zoological and geological knowledge to solve some of the zoogeographic problems of the Great Basin. However, the very nature of this historic work was restricted because these authors dealt exclusively with the fresh water fishes, a very specialized and geographically restricted faunal group. Banta (1963a, b, c) has made a preliminary attempt to synthesize geological and zoological knowledge pertaining to the zoogeography of a terrestrial group, the lizards.

Joseph Grinnell and Hilda Wood Grinnell (1907) made a study of reptiles of Los Angeles County, California, which was the first study of the herpetofauna of a given political subdivision, part of which was within the confines of the Great Basin. They recognized the distinctions between faunas of the north and south slopes of the San Gabriel Mountains (i.e., the Great Basin and Pacific drainage faunas).

Walter Penn Taylor (1912) presented the first faunistic survey of a section of Nevada (northern Humboldt County, vicinity of the

Pine Forest Mountains) which included a study of reptiles and amphibians, as well as the avifauna, inhabiting the area at that time. This treatise was done during the summer of 1909, under the direction of Joseph Grinnell. Taylor was assisted in the field by Mr. C. H. Richardson, Jr. This was the first of the prolonged and extensive zoological collecting and studies in the western Great Basin by students and staff of the University of California Museum of Vertebrate Zoology at Berkeley.

Charles Lewis Camp (1916) critically commented on the status of several western North American lizards, including species inhabiting the Great Basin, based upon samples in the herpetological collections of the Museum of Vertebrate Zoology at Berkeley, and was the first to suggest the extent of variation of several species. A more complete systematic and geographic account of California reptile samples at Berkeley was authored by Grinnell and Camp (1917), in which trinomial names were assigned to most of the species considered in conformity to the growing nominal recognition of geographic variation.

The Museum of Vertebrate Zoology sponsored numerous extensive collecting expeditions to Nevada during the thirties and early forties under the financial assistance of Miss Annie Montague Alexander. An early result of these efforts was compiled by Jean Myron Linsdale (1938) which included all terrestrial vertebrates of Big Smoky Valley region, in northwestern Nye County, with emphasis on birds and mammals. Linsdale later (1940) provided the most inclusive account of the amphibians and reptiles in the state of Nevada, based primarily upon material obtained by the extensive activities of staff and graduate students of the Museum of Vertebrate Zoology. Since Linsdale's paper was completed (early 1938) collectors for the Museum of Vertebrate Zoology have added several thousand more specimens of reptiles from the Great Basin to their collections, and much of this newer material has not yet been reported. Regarding the Museum of Vertebrate Zoology field activities, Linsdale (1940:197) stated, "On each expedition the collectors have been on the lookout for specimens of amphibians and reptiles in addition to *their main objectives which usually were concerned with mammals or birds.*" (our italics). Robert C. Stebbins' studies (1954, 1958) on western North American herpetology has included much information of import to the Great Basin. Ira John La Rivers (1942) made some additions to Linsdale's work on Nevada, based upon material which was to form the nucleus for the herpetological collection of the Museum of Biology at the University of Nevada, established largely through the interest of La Rivers. Banta (1950, 1953) has reported on some aspects of the growing University of Nevada collections.

In 1922 there appeared the two volume study of *The Reptiles of Western North America* by Dr. John Van Denburgh of the California Academy of Sciences. Considerable efforts had been expended in the compilation of this major report. During its many years of preparation, Van Denburgh dispatched Joseph Richard Slevin at

various times to many areas of the western United States, including some Great Basin localities, to obtain specimen material. The various lists published by Van Denburgh and Slevin prior to 1922 (1912a, b, 1915, 1921a, 1921b) were simply progress reports of this major effort. Van Denburgh included material on the habits and life histories as well as systematic notes and distribution records, the latter based chiefly on material in the California Academy of Sciences and Stanford University collections. The black and white photographs illustrating many of the species treated in this work remain some of the best yet available. An account reviewing the herpetological activities of the California Academy of Sciences is provided by Slevin and Leviton (1956). Material obtained in the Saline Valley hydrographic basin by Banta (1963b) is deposited in the collections of the California Academy of Sciences.

During the summer of 1928 Charles Earle Burt and May Danheim Burt collected herpetological specimens in the Great Basin incidental to traveling through the region en route to the Pacific Coast. The material collected was deposited in the Museum of Zoology, University of Michigan and the United States National Museum (Burt and Burt, 1929). The Burts repeated their journey across the Great Basin during August of 1932 and further elaborated on their experiences similar to those of 1928 (Burt, 1933). Most of the specimens obtained in 1932 were deposited in the United States National Museum.

As noted above most of the references have referred to the western Great Basin in Nevada and California. However, the eastern part in Utah and eastern Nevada was being worked by various herpetologists, particularly since 1918.

An active period of herpetological research began in 1922 and 1925 when Herbert J. Pack at Utah State College and Vasco M. Tanner at Brigham Young University initiated their studies at Logan and Provo, Utah. V. M. Tanner was one of the more active of the recent workers to carry out extensive studies on the fishes, amphibians and reptiles of the Great Basin.

The first important collections from this area (Bonneville Basin) were made by the Stansbury Expedition in 1849-50 and reported by Baird and Girard in 1852a and 1852b and by Girard in 1858. In these early reports are the original descriptions of eight Great Basin reptiles. Some have been reduced to subspecific status, but all still appear in the current check lists (Schmidt, 1953).

After these early reports few collections were made and reported until Herbert J. Pack began his herpetological activities at Utah State Agricultural College at Logan, Utah. His first reports appeared in 1918 and extended to 1930. Although Pack was interested in systematics, most of his reports were studies of food habits. His major systematic report was the "Snakes of Utah," published posthumously and edited by George Franklin Knowlton in 1930. Knowlton and his co-workers continued the studies of Pack (1935-1950), publishing a long series of papers mostly on lizard food habits. Some of the animals collected by Pack and Knowlton are deposited

in the collections at Brigham Young University and the California Academy of Sciences.

Members of the staff and various graduate students of Brigham Young University since 1925 have amassed a large collection of herpetological specimens from the eastern Great Basin. Vasco Myron Tanner initiated the assemblage of the collections and published a series of accounts dealing with the herpetofauna of the eastern Great Basin and the rest of the state of Utah (1927a, 1927b, 1928, 1929, 1930, 1933). Field groups under his direction were so organized as to provide for sampling of all of the vertebrate and arthropod animal groups. Through the combined efforts of both staff and students the herpetological collection at Brigham Young University has become one of the larger assemblages of Great Basin reptiles. After 1940 this collection began to receive exotic materials and has since become much more than an assemblage of local specimens. The influence of V. M. Tanner in the eastern Great Basin has been comparable to that of Van Denburgh, Grinnell and Klauber in the western and southern sections of the region. It has been these men, their students and co-workers, who have during this century extended the knowledge of Great Basin herpetology. Since 1950 Wilmer W. Tanner has assumed the general supervision of and has conducted research on the North American segments of the herpetological collections at Brigham Young University. His first paper appeared in 1939 followed by numerous other studies concerned with aspects of the Great Basin herpetofauna. The large series of herpetological samples obtained at the Atomic Energy Commission Nuclear Testing Site in southern Nye County, Nevada, was published by Tanner and Jorgensen (1963).

The first and, to date, only account dealing with the reptiles of Utah and the eastern Great Basin was compiled by Angus Munn Woodbury (1931). This account was based primarily on material at Brigham Young University and collections at the University of Utah, acquired primarily by various faculty members and to a limited extent from high school teachers in central Utah. Woodbury and a number of his students have continued studies on the herpetology of the eastern Great Basin, most notable being the studies on snake dens (1940-1951). The final reporting of the den studies was done at a symposium in June, 1950. The published reports appeared in 1951 and were authored by Woodbury, Vetas, Julian, Glissmeyer, Heyrend and Call, Smart and Sanders. John M. Legler is continuing herpetological studies at the University of Utah, Salt Lake City.

Richard Patton Erwin, a professional musician with an intense avocational interest in herpetology, provided some worthy collections and reports (1925- 1928) from Great Basin portions of Idaho. Much of Erwin's material is deposited at Brigham Young University and the California Academy of Sciences. His field notes and journals are also at Brigham Young University.

The herpetofauna of the Great Basin portion of the state of Oregon requires much more study. Kenneth Gordon (1939), Robert

Macleod Storm and Richard A. Pimental (1949) provided the most recent information on this area.

In the spring of 1931 and 1932, the southern portions of the Great Basin were visited and collected by Laurence Monroe Klauber. These activities were made in his spare time in association with business activities for hydroelectric power from Hoover Dam for use in San Diego, California. Klauber was one of the first discoverers and advocates of collecting reptiles on paved highways, traveling by automobile at slow speeds. This method has yielded specimens of reptiles once thought to be rare, now known to be quite common, especially nocturnal snakes. Klauber's comprehensive investigations of reptiles, especially rattlesnakes, since the late twenties (1929-1956) have usually included species inhabiting the Great Basin. His numerous studies on reptile systematics has been enhanced by the introduction and use of statistics in evaluating data.

Charles Mitchell Bogert (1930) compiled the second list of the Los Angeles County herpetofauna based on his extensive field work within the county borders during months of July and August. In 1935 he sampled amphibians and reptiles in the vicinity of Hoover (Boulder) Dam and the then newly-formed reservoir, Lake Mead. A report on these activities was coauthored by Raymond Bridgeman Cowles (1936). The specimens obtained were deposited in the collections of the University of California at Los Angeles to form the nucleus for a now quite extensive collection. Although most of Bogert's collecting activities were within the Colorado River Basin, a small sampling of the isolated Spring (Charleston) Mountains, located on the border of the southwestern Great Basin area and the Colorado River Basin, was obtained. Kenneth Stafford Norris (1953, 1958) in his work on the ecology of desert dwelling lizards is continuing studies in the Mojave Desert as well as other areas at the University of California at Los Angeles.

Recently a report by Frederick B. Turner and Roland H. Wauer (1963) listed the reptiles occurring in Death Valley and provided ecological notes for the species.

Jay Mathers Savage (1960) in a herpetozoogeographical review of Baja California, Mexico, extended portions of this effort to include all of continental North America. Savage eliminated the existence of the Great Basin as a faunal area and included it with adjacent areas under the ambiguous term "Desert and Plains." Under this category were also included most of central Baja California, Arizona (exclusive of the central portion), and the state of Sonora, Mexico. It is interesting to note that to construct his hypothesis on the origin of the herpetofauna of Baja California, Savage relied on the paleobotanical works of Axelrod (1940-1958) in the Great Basin, studies which so far have excluded Baja California. Yet Savage did not consider the Great Basin worthy of recognition in his overall classification of herpetofaunal areas.

We believe that the large number of species and subspecies largely restricted to the Great Basin justifies its recognition as a faunal area. A careful examination of both vertebrates and arthro-

podis indicates that this general area has been isolated for a long enough period of time to provide for the development of a distinct fauna. In all respects it is faunistically distinct as are other adjacent areas. In the vertebrate groups adequate evidence is seemingly available in the many works dealing with the vertebrates of this area, but particularly in those of E. R. Hall, and S. D. Durant (mammals), E. D. Cope, L. M. Klauber, R. C. Stebbins, J. M. Linsdale, and the authors (reptiles) and J. O. Snyder, C. L. Hubbs, R. R. Miller, and V. M. Tanner (fishes).

To us the Great Basin represents not only a distinct physiographic region but also an area with many faunal segments restricted to it. The full impact of its physiographic isolation on the reptile fauna is not yet clear. We are well aware that there is yet much to be learned about the systematics of this fauna and anticipate that considerable information will come from the many systematic and ecological studies now being carried forward in the Great Basin.

BIBLIOGRAPHY²

- Axelrod, D. I. 1940. Late Tertiary floras of the Great Basin and border areas. *Bull., Torrey Bot. Club* 67:477-487.
- . 1948. Climate and evolution in western North America during Middle Pliocene time. *Evolution* 2:127-144.
- . 1950. Evolution of desert vegetation in western North America. *Carnegie Inst. Washington Publ.* 590:215-306.
- . 1956. Mio-Pliocene floras from west-central Nevada. *Univ. California Publ. Geol. Sci.* 33:1-332, pls. 1-32.
- . 1957. Late Tertiary floras and the Sierra Nevada uplift. *Bull. Geol. Soc. America* 68:19-45.
- . 1958. Evolution of the Madro-Tertiary geoflora. *Bot. Rev.* 24:433-509.
- Baird, S. F. 1858. Description of new genera and species of North American lizards in the museum of the Smithsonian Institution. *Proc., Acad. Nat. Sci. Philadelphia* 10:253-256.
- [Original description - *Xantusia vigilis*; California: Kern County, Fort Tejon].
- and Charles Girard. 1852a. Characteristics of some new reptiles in the museum of the Smithsonian Institution. *Proc. Acad. Nat. Sci. Philadelphia* 6:68-70.
- [Original descriptions of 1) *Cnemidorphorus tigris*; Valley of the great (sic.) Salt Lake, Utah. 2) *Crotaphytus wislizenii*; near Santa Fé, New Mexico. 3) *Uta* [new genus] *stansburiana*; Valley of Great Salt Lake. 4) *Sceloporus graciosus*; valley of the great (sic.) Salt Lake. 5) *Plestiodon skiltonianum* [= *Eumeces skiltonianus*]; Oregon. 6) *Coluber [constrictor] mormon*; valley of the Great Salt Lake. Charles Girard is solely credited with *Phrynosoma platyrhinos*; great Salt Lake.]
- . 1852b. Reptiles. Appendix C. In: Stansbury, Howard, An expedition to the Valley of the Great Salt Lake of Utah: including a description of its geography, natural history, and minerals, and an analysis of its waters; with an authentic account of the Mormon settlement. Philadelphia: Lippincott, Grambo & Co., pp. 336-353, 6 pls.
- [More detailed descriptions and illustrations for the preceding reptiles].
- . 1853. Catalogue of North American reptiles in the museum of the Smithsonian Institution. Part I. Serpents. *Smithsonian Inst., Washington, D.C.*, xvi + 172 pp.
- [Original descriptions of 1) *Eutainia* [= *Thamnophis elegans*] *elegans*;

2. Works containing original descriptions of new taxa from the Great Basin or adjacent areas are annotated; the geographic location following the specific name is the type locality.

El Dorado County, California. 2) *Eutainia* [= *Thamnophis elegans*] *vagrans*; California. 3) *Ophibolus* [= *Lampropeltis getulus*] *boylii*; El Dorado County, California. 4) *Diadophis regalis*; Sonora, Mexico. 5) *Sonora semiannulata*; Sonora, Mexico. 6) *Rhinocheilus lecontei*; San Diego, California. 7) *Rena* [= *Leptotyphlops*] *humilis*; Valliecititas, California].

- Banta, B. H. 1950. *Xantusia vigilis* in southern Nye County, Nevada. *Herpetologica* 6(2):34.
- . 1953. Southern Nevada reptile notes. *Herpetologica* 9(2):75-76.
- . 1957. A simple trap for collecting desert reptiles. *Herpetologica* 13(3):174-176.
- . 1960. Another record of *Tantilla utahensis* from Inyo County, California. *Herpetologica* 16(1):11.
- . 1961a. Variation and zoogeography of the lizards of the Great Basin. (abstract). *Dissertation Abstracts* 22(5):1361-2.
- . 1961b. Herbivorous feeding of *Phrynosoma platyrhinos* in southern Nevada. *Herpetologica* 17(2):136-137.
- . 1962a. Notes on the distribution of the western red-tailed skink, *Eumeces gilberti rubricaudatus* Taylor, in southern Nevada. *Herpetologica* 18(2):129-130.
- . 1962b. Beetles attacking lizards. *British Jour. Herpet.* 3(2):39.
- . 1963a. Remarks upon the natural history of *Gerrhonotus panamintinus* Stebbins. *Occas. Papers, California Acad. Sci.* 36:1-12, 7 figs., 1 pl.
- . 1963b. A preliminary account of the herpetofauna of the Saline Valley hydrographic basin, Inyo County, California. *Wasmann Jour. Biol.* 20(2):161-251.
- . 1963c. Preliminary remarks upon the zoogeography of the lizards inhabiting the Great Basin of the western United States. *Wasmann Jour. Biol.* 20(2):253-287.
- , and A. E. Leviton. 1961. Mating behavior of the Panamint lizard *Gerrhonotus panamintinus* Stebbins. *Herpetologica* 17(3):204-206.
- Bell, E. L. 1954. A preliminary report on the subspecies of the western fence lizard, *Sceloporus occidentalis*, and its relationship to the eastern fence lizard, *Sceloporus undulatus*. *Herpetologica* 10:31-36.
[Resurrected the name *Sceloporus occidentalis longipes* for Great Basin populations.]
- Bentley, G. H. 1918. *Hypsiglena ochrorhynchus* Cope in Nevada. *Copeia* (61):83-84.
- . 1919. Reptiles collected in the vicinity of Currant, Nye County, Nevada. *Copeia* (75):87-91.
- Blanchard, F. N. 1921. A revision of the king snakes: genus *Lampropeltis*. *United States Nat. Mus. Bull.* 114, 260 pp.
- . 1939. Snakes of the genus *Tantilla* in the United States. *Zool. Ser., Field Mus. Nat. Hist.* 20(28):369-376.
- . 1942. The ring-necked snakes, genus *Diadophis*. *Chicago Acad. Sci. Bull.* 7:5-144.
- Bogert, C. M. 1930. An annotated list of the amphibians and reptiles of Los Angeles County, California. *Bull. So. California Acad. Sci.* 29(1):1-14.
- . 1939. A study of the genus *Salvadora*, the patch-nosed snakes. *Publ. Univ. California at Los Angeles, Biol. Sci.* 1(11):177-236, pls. 3-7.
- . 1945. Two additional races of the patch-nosed snake, *Salvadora hexalepis*. *American Mus. Novitates* 1285, 14 pp.
[Original description of *Salvadora hexalepis mojavensis*; California: San Bernardino County, south end of Granite Mountains, 11.5 miles southeast of Victorville.]
- Bryant, H. C. 1911. The horned lizards of California and Nevada of the genera *Phrynosoma* and *Anota*. *Univ. California Publ. Zool.* 9(1):1-84, pls. 1-9.
- Burger, W. L. 1950. New, revised, and reallocated names for North American whip-tailed lizards, genus *Cnemidophorus*. *Nat. Hist. Miscellanea* 65:1-9.
[Resurrection of the name *Cnemidophorus tigris* Baird and Girard for Great Basin populations.]

- Burt, C. E. 1933. Some lizards from the Great Basin of the west and adjacent areas, with comments on the status of various forms. *American Midl. Nat.* 14:228-250.
- , and M. D. Burt. 1929. Field notes and locality records on a collection of amphibians and reptiles chiefly from the western half of the United States. II. Reptiles. *Jour. Washington Acad. Sci.* 19(20):448-460.
- Camp, C. L. 1916. The subspecies of *Sceloporus occidentalis* with description of a new form from the Sierra Nevada and systematic notes on other California lizards. *Univ. California Publ. Zool.* 17:63-74.
[Original description - *Sceloporus occidentalis taylora*; California: Yosemite National Park, half way between Merced Lake and Sunrise trail, 7500 ft.]
- Cochran, D. M. 1961. Type specimens of reptiles and amphibians in the U. S. National Museum. *United States Nat. Mus. Bull.* 220:xv + 291.
[Holotype of *Rhinostoma occipitale* [= *Chionactis occipitalis*] was found after publication (= USNM 8030)]
- Cooper, J. G. 1870. The fauna of California and its geographical distribution. *Proc., California Acad. Sci., Ser. 1*, 4:61-81.
- Cope, E. D. 1867. On a collection of reptiles from Owen's Valley, California, made by Dr. G. H. Horn, with remarks on the origin of species. *Proc., Acad. Nat. Sci. Philadelphia* 21:85-86.
[Original description - *Chilomeniscus ephippicus*; California: Inyo County, Owen's Valley. No specimens of *Chilomeniscus* have since been found to inhabit California.]
- . 1875. Checklist of North American batrachians and reptiles. *Bull. U. S. Nat. Mus.* 1:1-104.
- . 1883a. Zoological geography of western North America. *Science* 1:21.
- . 1883b. On the fishes of the recent and Pliocene lakes of the western part of the Great Basin, and of the Idaho Pliocene lake. *Proc., Acad. Nat. Sci. Philadelphia* 17:134-166, map.
- . 1883c. Notes on the geographical distribution of Batrachia and Reptilia of western North America. *Proc., Acad. Nat. Sci. Philadelphia* 17:10-35.
- . 1889. The Silver Lake of Oregon and its region. *American Nat.* 23:970-982, pls. 40-41.
- . 1893. The report of the Death Valley Expedition. *American Nat.* 27:990-995.
- . 1896a. On two new species of lizards from Southern California. *American Nat.* 30:833-6.
[Original description *Anota* [= *Phrynosoma*] *calidiarum*; Death Valley, California.]
- . 1896b. On the genus *Callisaurus*. *American Nat.* 30:1049-50.
[Original description *Callisaurus* [*draconoides*] *rhodosticus*; El Rosario, Baja California, Mexico.]
- . 1900. The crocodylians, lizards, and snakes of North America. *Ann. Rept., United States Nat. Mus. for . . . 1898:55-1270*, pls. 1-36.
- Cowles, R. B. 1920. A list and some notes on the lizards and snakes represented in Pomona College Museum. *Journ. Entom. & Zool., Pomona Coll.* 12:63-66.
- , and C. M. Bogert. 1936. The herpetology of the Boulder Dam region (Nevada, Arizona, Utah). *Herpetologica* 1(1):33-42.
- Dice, L. R. 1943. The biotic provinces of North America. *Ann Arbor: Univ. Michigan Press*, viii + 78 pp.
- Durrant, S. D. 1952. Mammals of Utah. *Taxonomy and distribution. Univ. Kansas Publ., Mus. Nat. Hist.* 6:1-549.
- Erwin, R. P. 1925. Snakes in Idaho. *Copeia* (138):6-7.
- . 1928. List of Idaho reptiles and amphibians in the Idaho State Historical Museum. *Boise, 11th Biennial Report, State Historical Society of Idaho, 1926-1928:31-33.*
- Fitch, H. S. 1939. Desert reptiles in Lassen Co., California. *Herpetologica* 1:151-152.
- . 1940. A biogeographical study of the *ordinoides* Artenkreis of garter snakes (genus *Thamnophis*). *Univ. California Publ. Zool.* 44(1):1-150.

- and T. P. Maslin. 1961. Occurrence of the garter snake, *Thamnophis sirtalis*, in the Great Plains and Rocky Mountains. Univ. Kansas Publ., Mus. Nat. Hist. 13(5):289-308.
[Elaboration of the name *Thamnophis sirtalis fitchi* for both western and eastern Great Basin populations.]
- and W. W. Tanner. 1951. Remarks concerning the systematics of the collared lizard, with the description of a new subspecies. Trans. Kansas Acad. Sci. 54:548-59.
- Fox, W. 1951a. The status of the garter snake, *Thamnophis sirtalis tetrataenia*. Copeia 1951(4):257-267.
- . 1951b. Relationships among the garter snakes of the *Thamnophis elegans* Rassenkreis. Univ. California Publ. Zool. 50(5):485-530.
- Fremont, J. C. 1845. Report of the exploring expeditions to the Rocky Mountains in the year 1842, and to Oregon and North California in the years 1843-1844. Second session, United States Senate, 28th Congress, Washington, D. C., 693 pp.
- Girard, C. 1852. A monographic essay on the genus *Phrynosoma*. In: Stansbury, Howard, An expedition to the Valley of the Great Salt Lake of Utah: including a description of its geography, natural history, and minerals, and an analysis of its waters: with an authentic account of the Mormon settlement. Philadelphia. Lippincott, Grambo & Co., pp. 354-365, pls. 6-8.
- . 1858. Herpetology. U. S. Exploring expedition, during the years 1838, 1839, 1840, 1841, 1842, under the command of Charles Wilkes, U.S.N., vol. 20. Philadelphia: J. P. Lippincott & Co., xviii + 496 pp.
[Original description of *Phrynosoma* (subgenus *Tapaya*) *douglassi ornatum*; valley of Great Salt Lake].
- . 1858. Atlas Herpetology. Prepared under the superintendence of S. F. Baird. By authority of Congress. United States Exploring Expedition during the years 1838, 1839, 1840, 1841, 1842, under the command of Charles Wilkes, U.S.N. Philadelphia: C. Sherman & Son, Printers, pp. 1-10, pls. 1-31.
- Glismeyer, H. R. 1951. Egg production of the Great Basin rattlesnake. In: Symposium. A snake den in Tooele County, Utah. Herpetologica 7(1):24-27
- Gloyd, H. K. 1940. The rattlesnakes, genera *Sistrurus* and *Crotalus*. A study of zoogeography and evolution. Chicago Acad. Sci., Spec. Publ. 4, vii + 266 pp.
- Gordon, K. 1939. The amphibia and reptilia of Oregon. Oregon State Monographs, Studies in Zool. 1, 82 pp.
- Grinnell, J. 1908. The biota of the San Bernardino Mountains. Univ. California Publ. Zool. 5:1-170.
- and C. L. Camp. 1917. A distributional list of the amphibians and reptiles of California. Univ. California Publ. Zool. 17:127-208.
- and H. W. Grinnell. 1907. Reptiles of Los Angeles County, California. Throop Inst. Bull. 35, 64 pp.
- Grobman, A. B. 1941. A contribution to the knowledge of variation in *Opheodrys vernalis* (Harlan), with the description of a new subspecies. Misc. Publ., Mus. Zool., Univ. Michigan 50, 38 pp.
[Original description - *Opheodrys vernalis blanchardi*; Colorado: Las Animas County, Spanish Peaks, 8000 feet].
- Hall, E. R. 1929. A "den" of rattlesnakes in eastern Nevada. Bull. Antivenin Soc. America 3(3):79-80.
- . 1946. The mammals of Nevada. Berkeley and Los Angeles: Univ. California Press, xi + 710 pp.
- Hallowell, E. 1852. Descriptions of new species of reptiles inhabiting North America. Proc., Nat. Sci. Philadelphia 6:177-182.
[Original description - *Leptophis taenita* [= *Masticophis taeniatus*]; New Mexico].
- . 1854. Descriptions of new reptiles from California. Proc., Acad. Nat. Sci. Philadelphia 7:91-97.
[Original description - *Rhinostoma occipitale* [= *Chionactis occipitalis*]; California: Mojave Desert]
- Harris, Harry. 1928. Robert Ridgway with a bibliography of his published writings and fifty illustrations. The Condor, 30(1):4-118.

- Henshaw, H. W. 1919. Autobiographical Notes. *The Condor* 21(5):177-181.
- . 1920. Autobiographical Notes. *The Condor* 22(1):3-10.
- Heyrend, F. and A. Call. 1951. Growth and age in western striped racer and Great Basin rattlesnake. In Symposium: A snake den in Tooele County, Utah. *Herpetologica*, 7:28-40.
- Hubbs, C. L. and R. R. Miller. 1948. The Great Basin with emphasis on glacial and post-glacial times. II. The zoological evidence. *Bull., Univ. Utah*, 38. Biol. ser. 10:18-166.
- Jorgensen, C. D. and W. W. Tanner. 1963. The application of the density probability function to determine the home ranges of *Uta stansburiana stansburiana* and *Cnemidophorus tigris tigris*. *Herpetologica* 19(2):105-115.
- Julian, G. 1951. Sex ratios of the winter populations of the In Symposium: A snake den in Tooele County, Utah. *Herpetologica* 7(1):21-24.
- Klauber, L. M. 1929. Range extensions in California. *Copeia* 1(70):15-22.
- . 1930. New and renamed subspecies of *Crotalus confluentus* Say, with remarks on related species. *Trans., San Diego Soc. Hist.* 6(3):95-144, pls. 9-12.
[Original descriptions - (1) *Crotalus confluentus* [=viridis] *lutosus*; Utah: Millard County, 10 miles northwest of Abraham - (2) *Crotalus confluentus* [=mitchelli] *stephensi*; California: Inyo County, Panamint Mountains, 2 miles west of Jackass Springs. 6200 feet.]
- . 1931. A new species of *Xantusia* from Arizona, with a synopsis of the genus. *Trans., San Diego Soc. Nat. Hist.* 7:1-16, 1 pl.
- . 1932. Amphibians and reptiles observed en route to Hoover Dam. *Copeia* 1932(3):118-128.
- . 1939. Studies of reptile life in the arid southwest. *Bull. Zool. Soc. San Diego* 14, 100 pp.
- . 1941. The long-nosed snakes of the genus *Rhinocheilus*. *Trans., San Diego Soc. Nat. Hist.* 9(29):289-332, pls. 12-13.
- . 1943. The subspecies of the rubber snake, *Charina*. *Trans., San Diego Soc. Nat. Hist.* 10(7):83-90.
[Supported recognition of *Charina bottae utahensis* Van Denburgh.]
- . 1944. The sidewinder, *Crotalus cerastes*, with description of a new subspecies. *Trans. San Diego Soc. Nat. Hist.* 10(8):91-126, pls. 6-7, fig. 1.
- . 1945. The geckos of the genus *Coleonyx* with descriptions of a new subspecies. *Trans., San Diego Soc. Nat. Hist.* 10:133-216, 2 maps.
- . 1947. Classification and ranges of the gopher snakes of the genus *Pituophis* in the western United States. *Bull., Zool. Soc. San Diego* 22, 81 pp.
- . 1951. The shovel-nosed snake, *Chionactis*, with descriptions of two new subspecies. *Trans., San Diego Soc. Nat. Hist.* 11(9):141-204, pls. 9-10.
[Original description - *Chionactis occipitalis talpina*; Nevada: Nye County, 50 miles south of Goldfield, on the highway to Beatty.]
- . 1956. Rattlesnakes. Their habits, life histories, and influence on mankind. Berkeley and Los Angeles: Univ. California Press. 2 vols., xxix + 708, xvi, 709-1476 pp.
- Knowlton, G. F. 1936. Lizard digestion studies. *Herpetologica* 1(1):9-10.
- . 1937. Notes on three Utah lizards. *Herpetologica* 1(4):109-110.
- . 1938. Lizards in insect control. *Ohio Journ. Sci.* 38(5):235-238.
- . 1941. Notes on the brown-shouldered Uta. *Copeia* 1941(3):182.
- . 1942a. The brown-shouldered Uta - observations. *Herpetologica* 2(4):80.
- . 1942b. Reptiles eaten by birds. *Copeia* 1942(3):186.
- . 1942c. Range lizards as insect predators. *Journ. Econ. Entomol.* 35(4):602.
- . 1946a. Feeding habits of some reptiles. *Herpetologica* 3(3):77-80.
- . 1946b. Feeding notes on two small lizards. *Herpetologica* 3(4):143-144.
- . 1947a. Some insect food of an Idaho lizard. *Herpetologica* 3(5):177.
- . 1947b. The sagebrush swift in pasture insect control. *Herpetologica* 4(1):25.
- . 1948. Vertebrate animals feeding on the Mormon cricket. *American Midl. Nat.* 39(1):137-138.

- . 1949. Ladybird beetles in sagebrush swift stomachs. *Herpetologica* 4(+):151.
- Knowlton, G. F., and E. W. Anthon. 1935. *Uta stansburiana stansburiana* (Baird and Girard). *Copeia* 1935(+):183.
- Knowlton, G. F., W. D. Fronk, and D. R. Maddock. 1943. Seasonal insect food of the brown-shouldered *Uta* (lizard). *Jour. Econ. Entomol.* 35(6): 942.
- Knowlton, G. F., D. R. Maddock, and S. L. Wood. 1946. Insect food of the sagebrush swift. *Journ. Econ. Entomol.* 39(3):382.
- Knowlton, G. F., and W. P. Nye. 1946. Lizards feeding on ants in Utah. *Journ. Econ. Entomol.* 39(+):5-46.
- Knowlton, G. F., and C. F. Smith. 1935. The desert grid-iron tailed lizard. *Copeia* 1935(2):102-103.
- Knowlton, G. F., E. J. Taylor, and W. J. Hanson. 1948. Insect food of *Uta stansburiana stansburiana* in the Timpie area of Utah. *Herpetologica* 4(6): 197-198.
- Knowlton, G. F., and W. L. Thomas. 1936. Food habits of Skull Valley lizards (Tooele Co., Utah). *Copeia* 1936(1):64-66.
- Knowlton, G. F., and A. C. Valcarce. 1950. Insect food of the sagebrush swift in Box Elder County of Utah. *Herpetologica* 6(2):33-34.
- La Rivers, I. 1942. Some new amphibian and reptile records for Nevada. *Jour. Entomol. & Zool., Pomona Coll.* 34:35-68.
- Leviton, Alan E. 1953. Catalogue of the amphibians and reptile types in the Natural History Museum of Stanford University. *Herpetologica* 8:121-132.
- Linsdale, J. M. 1936. The birds of Nevada. *Pacific Coast Avifauna* 23. 145 pp.
- . 1938. Environmental responses of vertebrates in the Great Basin. *American Midl. Nat.* 19:1-206.
- . 1940. Amphibians and reptiles in Nevada. *Proc. American Acad. Arts and Sci.* 73:197-257.
- McLain, R. B. 1899. Critical notes on a collection of reptiles from the western coast of the United States. Published privately, Wheeling, West Virginia, 13 pp.
- Merriam, C. H. 1890. Results of a biological survey of the San Francisco Mountain region and desert of the Little Colorado in Arizona. *North American Fauna* 3:1-101.
- . 1895. The geographic distribution of life in North America with special reference to the Mammalia. *Proc., Biol. Soc. Washington*, 7:1-64.
- Nolan, T. B. 1943. The basin and range province in Utah, Nevada, and California. *United States Geol. Surv., Prof. Paper* 197-D:141-196.
- Norris, K. S. 1953. The ecology of the desert iguana *Dipsosaurus dorsalis*. *Ecology* 34:265-287.
- . 1958. The evolution and systematics of the iguanid genus *Uma* and its relation to the evolution of other North American desert reptiles. *Bull., American Mus. Nat. Hist.* 114:251-326.
- Osborn, H. F. 1931. Cope: master naturalist. The life and letters of Edward Drinker Cope with a bibliography of his writings classified by subject. Princeton, New Jersey: Princeton Univ. Press, xvi + 740 pp.
- Pack, H. J. 1918a. A burrowing habit of *Cnemidophorus tessellatus* (Say). *Copeia* (5):51-52.
- . 1918b. Some habits of the pigmy horned lizard. *Copeia* (63):91-92.
- . 1919. Note on food habits of the bull snake. *Copeia* (68):16.
- . 1921. Food habits of *Sceloporus graciosus graciosus* (Baird and Girard). *Proc., Biol. Soc. Washington* 34:63-66.
- . 1922. Food habits of *Crotaphytus wislizenii* Baird and Girard. *Proc., Biol. Soc. Washington* 35:1-4.
- . 1923a. Food habits of *Callisaurus ventralis ventralis* (Hallowell). *Proc., Biol. Soc. Washington* 36:79-82.
- . 1923b. Food habits of *Crotaphytus collaris baileyi* (Stejneger). *Proc., Biol. Soc. Washington* 36:83-84.
- . 1923c. The food habits of *Cnemidophorus tessellatus tessellatus* (Say). *Proc., Biol. Soc. Washington* 36:85-90.
- . 1930. Snakes of Utah (compiled by George Franklin Knowlton. *Utah Agri. Exper. Sta., Utah State Agric. College. Bull.* 221:1-32.

- Phelan, R. L., and B. H. Brattstrom. 1955. Geographic variation in *Sceloporus magister*. *Herpetologica* 11(1):1-14.
[Original descriptions - (1) *Sceloporus magister transversus*; California: Inyo County, Keough's Hot Springs, 7 miles south of Bishop; (2) *Sceloporus magister uniformis*; California: Los Angeles County, Valyermo.]
- Reeve, W. L. 1952. Taxonomy and distribution of the horned lizards, genus *Phrynosoma*. *Univ. Kansas Sci. Bull.* 34(14):817-960.
- Richardson, C. H., Jr. 1915. Reptiles of northwestern Nevada and adjacent territory. *Proc., United States Nat. Mus.* 48:403-435.
[Original description - *Callisaurus ventralis* [= *draconoides*] *myurus*; Nevada: Washoe County, Pyramid Lake Indian Agency (=Nixon).]
- Rodgers, T. L. and H. S. Fitch. 1947. Variation in the skinks (Reptilia: Lacertilia) of the *skiltonianus* group. *Univ. California. Publ. Zool.* 48:169-220, pls. 8-10.
- Ruthven, A. G. 1913. Description of a new *Uta* from Nevada. *Proc., Biol. Soc. Washington* 26:27-30.
[Original description - *Uta stansburiana nevadensis*; Nevada: Eureka County, Cortez Range west of Carlin.]
- . 1915. An interpretation of the distribution of the reptiles in Maggie Basin, Nevada. *Bull., American Geogr. Soc.*, 47:948-952.
- . 1926. Notes on Utah reptiles. *Occas. Papers, Mus. Zool., Univ. Michigan*, 179:1-4.
- . 1932. Notes on the amphibians and reptiles of Utah. *Occas. Papers, Mus. Zool., Univ. Michigan* 243:1-4.
- Ruthven, A. G. and H. T. Gaige. 1915. The reptiles and amphibians collected in northeastern Nevada by the Walker-Newcomb Expedition of the University of Michigan. *Occas. Papers, Mus. Zool., Univ. Michigan* 8:1-33.
- Sanders, R. T. 1951. Effects of venom injections in rattlesnakes. *In Symposium: A snake den in Tooele County, Utah. Herpetologica* 7(1):47-52.
- Savage, J. M. 1952. Studies on the lizard family Xantusiidae. I. The systematic status of the Baja California night lizards allied to *Xantusia vigilis*, with the description of a new subspecies. *American Midl. Nat.* 48(2):467-479.
- . 1960. Evolution of a peninsular herpetofauna. *In Symposium: The biogeography of Baja California and adjacent seas. Part III. Terrestrial and fresh-water biotas. Systematic Zool.* 9(3 & 4):184-212.
- . 1963. Studies on the lizard family Xantusiidae. IV. The genera. *Contribs. Sci., Los Angeles Co. Mus.* 71:1-38.
- Slevin, J. R. 1931. Range extensions of certain western species of reptiles and amphibians. *Copeia* 1931(3):140.
- . 1934. A handbook of reptiles and amphibians of the Pacific states including certain eastern species. *Special Publ., California Acad. Sci.*, 73 pp.
- and A. E. Leviton. 1956. Holotype specimens of reptiles and amphibians in the collection of the California Academy of Sciences. *Proc., California Acad. Sci.*, Ser. 4, 28:526-560.
- Schmidt, K. P. 1953. A check list of North American amphibians and reptiles. *American Soc. Ichthyologists and Herpetologists* 6th ed. vii + 280 pp.
- Smart, E. W. 1951. Color analysis in the Great Basin rattlesnake. *In: Symposium, A snake den in Tooele County, Utah. Herpetologica* 7(1):41-46.
- Smith, H. M. 1939. The Mexican and Central American lizards of the genus *Sceloporus*. *Zool. Ser., Field Mus. Nat. Hist.* 26:1-397, 31 pls.
- . 1946. *Handbook of lizards. Lizards of the United States and of Canada.* Ithaca, N. Y.: Comstock Publishing Co., Inc., xxi + 557 pp.
- Snyder, J. O. 1917. The fishes of the Lahontan system of Nevada and north-eastern California. *Bull., United States Bureau of Fisheries*, 35:31-86, pls. 3-5.
- Stebbins, R. C. 1954. *Amphibians and reptiles of western North America.* New York: McGraw-Hill Book Co., Inc., xxii + 528 pp., 104 pls.

- . 1958. A new alligator lizard from the Panamint Mountains, Inyo County, California. *American Mus. Novitates* 1883:1-27.
[Original description - *Gerrhonotus panamintinus*; California: Inyo County, Panamint Mountains, Surprise Canyon, 4500 feet.]
- Stejneger, L. H. 1890. Annotated list of reptiles and batrachians collected by Dr. C. Hart Merriam and Vernon Bailey on the San Francisco Mountain Plateau and Desert of the Little Colorado, Arizona, with descriptions of new species. *North American Fauna* 3:103-126, pls. 12-13.
[Original description of *Crotaphytus [collaris] baileyi*; Painted Desert, Little Colorado River, Arizona.]
- . 1893. Annotated list of the reptiles and batrachians collected by the Death Valley Expedition in 1891, with description of new species. *North American Fauna* 7:159-229.
[Original descriptions of (1) *Gerrhonotus scincicauda* [= *coeruleus*] *palmeri*; California: Fresno County, South Fork of King's River. (2) *Pituophis catenifer deserticola*; Utah: Washington County, Beaver Dam Mountains.]
- . 1919. The name of the horned-toad from the Salt Lake Basin. *Copeia* (65):3-4.
[Resurrection of the name *Phrynosoma douglassii ornatum* Girard 1858 for eastern Great Basin populations.]
- Stone, W. 1911. On some collections of reptiles and batrachians from the western United States. *Proc. Acad. Nat. Sci. Philadelphia* 63:222-232.
- Storm, R. M. and R. A. Pimental. 1949. Herpetological notes from Malheur Co., Oregon. *Great Basin Nat.* 9:59-63.
- Stuart, L. C. 1932. The lizards of the Middle Pahvant Valley, Utah: materials for a study in saurian distribution. *Occas. Papers, Mus. Zool., Univ. Michigan* 244:1-33.
- Tanner, V. M. 1927a. Distributional list of the amphibians and reptiles of Utah. *Copeia* (163):54-58.
- . 1927b. First zoological expedition of Brigham Young University, 1926. *Proc., Utah Acad. Sci., Arts and Letters* 4:23-24.
- . 1928. Distributional list of the amphibians and reptiles of Utah. No. 2. *Copeia* (166):22-28.
- . 1929. A distributional list of the amphibians and reptiles of Utah, No. 3. *Copeia* (171):46-52.
- . 1930. The amphibians and reptiles of Bryce Canyon National Park, Utah. *Copeia* 1930 (2):41-43.
- . 1933. A study of the variation of the dorsal scale rows of *Charina bottae* (Blainville). *Copeia* 1933(2):81-84.
- . 1940. A chapter in the natural history of the Great Basin, 1800-1855. *Great Basin Nat.* 1(2):33-61.
- . 1942. Notes on the birth and growth of horned lizards. *Great Basin Nat.* 3(2):60.
- . 1948. Conservation of cold-blooded vertebrates. *Proc. Utah Acad. Sci., Arts, and Letters*, 25:41-42.
- . 1949. Notes on the number, length, and weight of young garter snakes. *Great Basin Nat.* 9(3-4):51-54.
- . 1957. Joseph Richard Slevin (1881-1957). *Great Basin Nat.* 17(1-2):56-58.
- Tanner, V. M. and W. W. Tanner. 1939. Notes on *Charina bottae* in Utah: reproduction. *Great Basin Nat.* 1(1):27-30.
- Tanner, W. W. 1939. Reptiles of Utah County. *Proc., Utah Acad. Sci., Arts and Letters*, 16:107.
- . 1939. The status of the Utah gopher snake. *Utah Acad. Sci., Arts and Letters*, 26:107.
- . 1940. Notes on the herpetological specimens added to the Brigham Young University collection during 1939. *Great Basin Nat.* 1(3):138-146.
- . 1941a. A study of the variation in the less common snakes of Utah. *Great Basin Nat.* 2(1):16-28.
- . 1941b. The reptiles and amphibians of Idaho. No. 1. *Great Basin Nat.* 2(2):87-97.

- . 1943. Notes on the life history of *Eumeces skiltonianus skiltonianus*. Great Basin Nat. 4(2):81-88.
- . 1946. A taxonomic study of the genus *Hypsiglena*. Great Basin Nat. 5(3-4):25-92.
[Original description - *Hypsiglena o. [ochorhynchus]* (= *torquata deserticola*; Utah: Utah County, west side of Cedar Valley, between 3-4 miles northwest of Chimney Rock.)
- . 1949. Food of the wandering garter snake, *Thamnophis elegans vagrans* (Baird and Girard), in Utah. Herpetologica 5(4):85-86.
- . 1950. Variation in the scale and color pattern of the wandering garter snake in Utah and southern Idaho. Herpetologica 6(7):194-196.
- . 1952. *Diadophis regalis regalis* (B. & G.) found in Nevada. Great Basin Nat. 12(1-4):63-64.
- . 1953. A study of taxonomy and phylogeny of *Lampropeltis pyromelana* Cope. Great Basin Nat. 13(1-2):47-66.
[Original description - *Lampropeltis pyromelana infralabialis*; Utah: Beaver County.]
- . 1957. A taxonomic and ecological study of the western skink (*Eumeces skiltonianus*). Great Basin Nat. 17(3-4): 59-95.
[Original description - *Eumeces skiltonianus utahensis*; Utah; Utah County, southeastern edge of Cedar Valley, approximately one half mile directly west of Chimney Rock.]
- Tanner, W. W. and B. H. Banta. 1963a. The distribution of *Tantilla utahensis*. Great Basin Nat. 22(4):116-18.
- . 1963b. The systematics of *Crotaphytus wislizeni*, the leopard lizards. Part I. A redescription of *Crotaphytus wislizeni wislizeni* Baird and Girard, and a description of a new subspecies from the Upper Colorado River Basin. Great Basin Nat. 23(3-4):129-148.
[Original description - *Crotaphytus wislizeni punctatus*; Utah: Grand County; Yellow Cat mining district, ± 10 miles south of U. S. Highway 50-6.]
- Tanner, W. W. and C. Jorgensen. 1963. Reptiles of the Nevada Test Site. Brigham Young Univ. Sci. Bull., Biol. Ser. 3(3):1-31.
- Tanner, W. W. and R. B. Loomis. 1957. A taxonomic and distributional study of the western subspecies of the milk snake, *Lampropeltis doliata*. Trans., Kansas Acad. Sci. 60(1):12-42.
[Original description - *Lampropeltis doliata taylori*; Utah: Utah County, approximately 2 miles north of Alpine.]
- Taylor, E. H. 1935. A taxonomic study of the cosmopolitan scincoid lizards of the genus *Eumeces* with an account of the distribution and relationships of its species. Univ. Kansas Sci. Bull. 23, 643 pp.
[Original description - *Eumeces gilberti rubricaudatus*; California: Kern County, Tehachapi Mountains.]
- Taylor, W. P. 1912. Field notes on amphibians, reptiles and birds of northern Humboldt County, Nevada, with a discussion of some of the faunal features of the region. Univ. California Publ. Zool. 7(10):319-436.
- Turner, Frederick B. and Roland H. Wauer. 1963. A survey of the herpetofauna of the Death Valley Area. Great Basin Nat. 23(3-4):119-128.
- Van Denburgh, J. 1897. The reptiles of the Pacific Coast and Great Basin. Occas. Papers, California Acad. Sci. 5:1-236.
- . 1912a. Notes on some reptiles from Southern California and Arizona. Proc., California Acad. Sci., ser. 4, 3:147-154.
- . 1912b. Notes on some reptiles and amphibians from Oregon, Idaho, and Utah. Proc., California Acad. Sci., ser. 4, 3:155-160.
- . 1920a. A further study of variation in the gopher snakes of western North America. Proc., California Acad. Sci., ser. 4, 10(3):1-28.
- . 1920b. Description of a new subspecies of boa (*Charina bottae utahensis*) from Utah. Proc., California Acad. Sci., ser. 4, 10(1):31-32.
[Original description - *Charina bottae utahensis*; Utah: Wasatch County, Wasatch Mountains, Little Cottonwood Canyon.]

- . 1922. The reptiles of western North America. Occas. Papers, California Acad. Sci., no. 10, 2 vols., 1028 pp.
- Van Denburgh, J. and J. R. Slevin. 1915. A list of the amphibians and reptiles of Utah, with notes on the species in the collection of the Academy. Proc., California Acad. Sci., ser. 4, 5(4):99-110.
- . 1918. The garter snakes of western North America. Proc., California Acad. Sci., ser. 4, 8(6):181-270.
- . 1919. The gopher snakes of western North America. Proc., California Acad. Sci., ser. 4, 9(6):197-220.
- . 1921a. A list of the amphibians and reptiles of Nevada with notes on the species in the collection of the Academy. Proc., California Acad. Sci., ser. 4, 11(2):27-83.
- . 1921b. A list of the amphibians and reptiles of Idaho, with notes on the species in the collection of the Academy. Proc., California Acad. Sci., ser. 4, 11(3):38-47.
- Vetas, B. 1951. Temperatures of entrance and emergence. *In* Symposium: A snake den in Tooele County, Utah. *Herpetologica* 7(1):15-20.
- Woodbury, A. M. 1931. A descriptive catalog of the reptiles of Utah. Bull., Univ. Utah, 21(5): x + 129.
- . 1941. Copulation in gopher snakes. *Copeia* 1941(1):54.
- . 1944. My rattlesnake bite. Proc. Utah Acad. Sci., Arts & Letters, 19 & 20:179-184.
- . 1948. Marking reptiles with an electric tattooing outfit. *Copeia* 1948 (2):127-128.
- . 1951. Introduction - a ten-year study. *In* Symposium: A snake den in Tooele County, Utah. *Herpetologica* 7(1):1-14.
- . 1952. Amphibians and reptiles of the Great Salt Lake Valley. *Herpetologica* 8(2):42-50.
- . 1953. Methods of field study in reptiles. *Herpetologica* 9(2):87-92.
- . 1954. Study of reptile dens. *Herpetologica* 10(1):49-53.
- . 1956. Ecological check lists. The Great Salt Lake Desert series. Ecological Res. Report, Univ. Utah, pp. 1-125 (mimeographed).
- and R. M. Hansen. 1950. A snake den in Tintic Mountains, Utah. *Herpetologica* 6:66-70.
- and D. D. Parker. 1956. A snake den in Cedar Mountains and notes on snakes and parasitic mites. *Herpetologica* 12:261-268.
- and E. W. Smart. 1950. Unusual snake records from Utah and Nevada. *Herpetologica* 6:45-47.
- Woodbury, Marian and A. M. Woodbury. 1945. Life history studies of the sagebrush lizard *Sceloporus g. graciosus* with special reference to cycles in reproduction. *Herpetologica* 2:175-196.
- Yarrow, H. C. 1875. Report upon the collections of batrachians and reptiles made in portions of Nevada, Utah, California, Colorado, New Mexico, and Arizona during the years 1871, 1872, 1873, and 1874. Report, Geographical and Geological Explorations and Surveys west of 100th Meridian (Wheeler Survey), vol. 5. Zoology, ch. 4, pp. 509-584.
- . 1883. Check list of North American reptilia and batrachia with catalogue of specimens in U. S. National Museum. United States Nat. Mus. Bull. 24, 249 pp.
- and H. W. Henshaw. 1878. Report upon the reptiles and batrachians collected during the years 1875, 1876, and 1877, in California, Arizona, and Nevada. Appendix NN. Annual Report, Chief of Engineers for 1878. Geographical Survey of the Territory of the United States west of the 100th Meridian. Washington, D. C., pp. 206-226.